

What is claimed is:

1. A cathode for an electron tube, comprising a base metal and an electron-emitting material layer attached on the base metal, wherein the electron-emitting material layer comprises a needle-shaped conductive material and a surface roughness, which is measured from the distance between a highest point and a lowest point of the surface of the electron-emitting material layer, is controlled to be no greater than  $10\ \mu\text{m}$ .

2. The cathode of claim 1, wherein the needle-shaped conductive material has specific resistance of  $10^{-1}\ \Omega\text{cm}$  or less.

3. The cathode of claim 1, wherein the needle-shaped conductive material is at least one selected from the group consisting of carbon, indium tin oxide, nickel, magnesium, rhenium, molybdenum and platinum.

4. The cathode of claim 1, wherein the needle-shaped conductive material is a carbon material.

5. The cathode of claim 4, wherein the needle-shaped conductive material is selected from the group consisting of carbon nanotube, carbon fiber and graphite fiber.

6. The cathode of claim 1, wherein the content of the needle-shaped conductive material contained in the electron-emitting material layer is in the range of 0.01 to 30% by weight based on the weight of the electron-emitting material layer.

7. The cathode of claim 6, wherein the electron-emitting material layer is a carbonate having barium (Ba) as a main component.

8. The cathode of claim 1, wherein the thickness of the electron-emitting material layer is 30-80  $\mu\text{m}$ .

5 9. The cathode of claim 1, wherein the needle-shaped conductive material is a carbon material, the content of the needle-shaped conductive material contained in the electron-emitting material layer is in the range of 0.01 to 30% by weight based on the weight of the electron-emitting material layer exclusive of the needle-shaped conductive material, and the thickness of the electron-emitting material layer is 30-80  $\mu\text{m}$ .

10 10. The cathode of claim 1, wherein the electron-emitting material layer is attached on the base metal by one of printing, electrodeposition and painting.

15 11. The cathode of claim 1, wherein the electron-emitting material layer is attached to the base metal by a screen printing method.

20 12. The cathode of claim 1, further comprising a metal layer having nickel having a smaller grain size than the metal base, between the metal base and the electron-emitting material layer.

25 13. The cathode of claim 12, wherein the metal layer further comprises 1 to 10% by weight of tungsten and 0.01 to 1% by weight of aluminum, based on the weight of nickel.

30 14. The cathode of claim 12, wherein the thickness of the metal layer is 1-30  $\mu\text{m}$ .

15. The cathode of claim 13, wherein the metal layer further comprises at least one metal selected from the group consisting of tantalum (Ta), chrome (Cr), magnesium (Mg), silicon (Si) and zirconium (Zr).

16. The cathode of claim 13, wherein the metal layer is formed with a gauze or dot pattern.